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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Wade Brown
App. No	:	0
Filed	:	January 24, 2004
For	:	FILLED POLYMER COMPOSITE AND SYNTHETIC BUILDING MATERIAL COMPOSITIONS
Examiner	:	Alicia Chevalier
Art Unit	:	1772

DECLARATION UNDER 37 C.F.R. § 1.132 BY INVENTOR, WADE H. BROWN

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, Wade H. Brown, hereby declare:

1. I am the named inventor in the above-referenced U.S. patent application.

2. I am also the President of Century-Board USA, LLC, the present assignee of the entire right, title, and interest in the above-referenced U.S. patent application.

3. I received my B.A. in Chemistry from the University of Kentucky, with post graduate courses in a polymer engineering and advanced chemistry courses.

4. I worked for 21 years as a research chemist for CIBA-GEIGY, a world leader in polymers and polymer additives. My work included additives for polyurethanes, and this involved considerable investigations into the chemistry of urethanes, including aliphatic, aromatic, foamed and coating types. My work resulted in a patent in the area of polymer stabilization. I also worked with urethanes and other polymer systems, investigating the

effect of fillers and fibers on the resulting polymer system properties, and the processing of these systems.

5. Following this, I worked for about 5 years at ABB Composites, and then 10 years at Kaiser Composites, again focusing on polymer systems with fibers and fillers, and their processing.

6. Fifteen years ago, I started Ecomat Nevada, Inc. Through this company, we offered licenses to building material firms based on highly filled foamed polyurethane systems. In addition to licensing technology, we invested substantial time, money and effort developing other proprietary polymer compositions with very high loadings of waste fillers.

7. Eight years ago, I started a second company called Century-Board USA, LLC. Through this company, we continued to research and develop new polymer compositions with very high loadings of waste fillers, including polyurethane compositions with very high loadings of waste fillers.

8. As a result of my close involvement in the development of various polymer composite materials and my general knowledge of building products made from the same, I have acquired extensive knowledge of the manner in which such technology has developed over the last 35 years.

9. I am the listed inventor on the present application. **Independent Claim 1** of the present application is directed to:

> A polymer composite material, comprising:
> (1) only one polymer matrix, the matrix consisting essentially of a polyurethane and an optional polyisocyanurate, the polyurethane formed by reaction of a reaction mixture, comprising:
> (a) one or more monomeric or oligomeric poly- or di-isocyanates;
> (b) a first polyol selected from the group consisting of polyether polyols and polyester polyols, the first polyol_having a first hydroxyl number; and
> (c) a second polyol selected from the group consisting of polyether polyols and polyester polyols, the second polyol having a second hydroxyl number less than the first hydroxyl number, and forming the polyurethane, wherein the polyurethane is less rigid than a second polyurethane that would be formed by the reaction of the first polyol and the one or more

monomeric or oligomeric poly- or di-isocyanates in the absence of the second polyol, and wherein the second polyol is between about 5 wt % and about 20 wt %, based on the total weight of the first and second polyols being 100 wt %; and

(2) an inorganic particulate material comprising one or more of fly ash, bottom ash, particulate glass and granite tailings dispersed in the polymer matrix, the inorganic particulate material being about 60 to about 85 wt%, based on the total weight of the composite material.

Independent Claim 44 of the present application is directed to:

A polymer composite material, comprising:

a polyurethane and an optional polyisocyanurate, the polyurethane formed by reaction of a reaction mixture, comprising:

one or more monomeric or oligomeric poly- or di-isocyanates;

a first polyol selected from the group consisting of polyether polyols and polyester polyols, the first polyol having a first hydroxyl number; and

at least a second polyol selected from the group consisting of polyether polyols and polyester polyols, the second polyol having a second hydroxyl number less than the first hydroxyl number and forming the polyurethane, wherein the polyurethane is less rigid than a second polyurethane that would be formed by the reaction of the first polyol and the one or more monomeric or oligomeric poly- or di-isocyanates in the absence of the second polyol and wherein the second polyol is between about 5 wt % and about 20 wt %, based on the total weight of the first and second polyols being 100 wt %; and

an inorganic particulate material dispersed in the polymer matrix, the inorganic particulate material being about 60 to about 85 wt %, based on the total weight of the composite material.

Independent Claim 62 of the present application is directed to:

A polymer composite material comprising:

(1) a polymer matrix comprising a polyurethane and an optional polyisocyanurate, the polyurethane formed by reaction of a reaction mixture, comprising:

(a) one or more monomeric or oligomeric poly- or di-isocyanates;

(b) a first saturated polyol selected from the group consisting of polyether polyols and polyester polyols, the first polyol having a first hydroxyl number; and

(c) a second saturated polyol selected from the group consisting of polyether polyols and polyester polyols, the second polyol

having a second hydroxyl number less than the first hydroxyl number, and forming the polyurethane, wherein the polyurethane is less rigid than a second polyurethane that would be formed by the reaction of the first polyol and the one or more monomeric or oligomeric poly- or di-isocyanates in the absence of the second polyol, and wherein the second polyol is between about 5 wt % and about 20 wt %, based on the total weight of the first and second polyols being 100 wt %; and

(2) about 60 to about 85 wt% of an inorganic particulate material, based on the total weight of the composite material.

10. As shown above, each of Independent Claims 1, 44 and 62 claim "the second polyol is between about 5 wt % and about 20 wt %, based on the total weight of the first and second polyols being 100 wt %."

11. It is my understanding that Independent Claims 1, 44 and 62 were rejected in the latest Office Action mailed January 7, 2008. It is also my understanding that the Examiner rejected these claims as obvious over Carslon et al (U.S. Patent No. 3,830,776) in view of Weisman (U.S. Patent No. 4,439,548).

12. In particular, the Examiner cited Weisman as teaching that "the second polyol is between about 5 wt% and about 20 wt% based on the total weight of the first and second polyols being 100 wt% (col. 6, lines 27-53).

13. I have examined this portion of Weisman, which in relevant part states the following:

In a preferred embodiment of the invention, a polyol blend is employed comprising a polyether triol, having a molecular weight range of about 1,000-8,000 and a hydroxyl number range of about 20-175, and a diol having a molecular weight range of about 60-3,000 and a hydroxyl number range of about 50-200. The weight ratio of polyether triol to diol, according to this preferred embodiment, can range from about 1:8 to about 6:8.

14. Based on this disclosure, Weisman teaches that the polyether triol may have a hydroxyl number range from about 20-175 and the diol can have a hydroxyl number range from about 50-200. Furthermore, Weisman teaches that the weight ratio of polyether triol to diol can range from about 1:8 to about 6:8, which is calculated to be about 11 wt% to about 43 wt% based on the total weight of the triol and diol being 100%. It is my opinion that Weisman does not teach "the second polyol is between about 5 wt % and about 20 wt %, based on the total weight of the first and second polyol being 100 wt

%." In addition, Weisman fails to teach the criticality and unexpected results of this limitation.

Weisman Does Not Teach "The Second Polyol Is Between About 5 Wt % And About 20 Wt % Based On The Total Weight Of The First And Second Polyols Being 100 Wt %"

15. In my opinion, Weisman does not teach "the second polyol is between about 5 wt % and about 20 wt %, based on the total weight of the first and second polyol being 100 wt %." Although Weisman contains a generic description of the use of a triol and a diol in a composition, and that these components may be used in certain ratios, Weisman does not expressly disclose whether the triol or the diol has the lower hydroxyl number. A person of ordinary skill in the art might understand that the triol has a lower hydroxyl number than the diol. Alternatively, a person of ordinary skill in the art might understand that the triol has a higher hydroxyl number than the diol. In fact, Weisman's own disclosure shows this. The hydroxyl numbers for these components listed in Weisman overlap (20-175 (triol) vs. 50-200 (diol)). Thus, Weisman teaches away from the claims of the present application. In my opinion, because a triol may have a higher hydroxyl number than a diol, a person of ordinary skill in the art would not understand from Weisman whether to use a lower or higher hydroxyl number polyol in the specified ratios disclosed in that reference.

Weisman Fails To Teach The Criticality And Unexpected Results Of "The Second Polyol Is Between About 5 Wt % And About 20 Wt % Based On The Total Weight Of The First And Second Polyols Being 100 Wt %"

16. Assuming that the triol has a lower hydroxyl number than the diol, which is not necessarily the case according to the reference, Weisman merely contains a generic description of a broad weight percent range for the lower hydroxyl number polyol, based on the total weight of two polyols. In contrast to Weisman, Independent Claims 1, 44 and 62 recite, among other elements, a specific range of the lower hydroxyl number polyol,

based on the total weight of two polyols. As emphasized above, Independent Claims 1, 44 and 62 each recite "the second polyol is between about 5 wt % and about 20 wt %, based on the total weight of the first and second polyols being 100 wt %." In my opinion, the range of the lower hydroxyl number polyol included in Independent Claims 1, 44 and 62 is critical and shows unexpected results compared to the generic, broad range in Weisman. Specifically, in my opinion, at least in terms of flexural strength, polyurethane composites comprising two polyols according to each of Independent Claims 1, 44 and 62, shows criticality and unexpected results over the range wherein "the second polyol is between about 5 wt% and about 20 wt% based on the total weight of the first and second polyols being 100 wt%." Weisman does not teach or suggest the criticality of the range included in Independent Claims 1, 44 and 62.

17. In support of this opinion, I have included below a summary of tests conducted on several samples of polyurethane composites. These samples were produced by reacting an isocyanate with two polyols, one polyol having a hydroxyl number lower than the second polyol, in the presence of a very large amount of filler. Samples were produced with varying polyol concentration, filler amount and filler type.

18. Specifically, three sets of samples were produced: one set of samples comprised granite tailings in an amount equal to about 60 wt %, based on the total weight of the composition being 100 wt %, a second set of samples comprised fly ash in an amount equal to about 60 wt %, based on the total weight of the composition being 100 wt %, and a third set of samples comprised granite tailings in an amount equal to about 72 wt %, based on the total weight of the composition being 100 wt %. Within each of these sets, seven samples were prepared comprising different polyol concentrations. Specifically, within each set, samples were prepared wherein the lower hydroxyl number polyol in the composite comprised about 2, 5, 11, 20, 25, 30 and about 40 wt %, based on the total weight of the two polyols being 100 wt %.

19. Each sample was prepared by hand, requiring several mixing steps. After mixing, the resulting composites were poured into a mold box and molded to form sample boards

roughly 0.5 x 10 x 11 inches and these were then cut to test bars roughly 0.5 x 0.75 x 10 inches.

20. I tested each sample bar according to ASTM D790 to obtain flexural strength data. The results for each board were averaged together. The average flexural strength data was normalized for sample density using calculations common in the industry. The results of these tests are shown below.

Table 1. Flexural strength of polyurethane composite samples with varying polyol concentration, filler amount and filler type

Sample No.	Filler Type	Wt % Filler[1]	Wt % Lower Hydroxyl Number Polyol[2]	Flexural Strength (psi)
1A	Granite tailings	60	2	1601
2A	Granite tailings	60	5	1827
3A	Granite tailings	60	11	1962
4A	Granite tailings	60	20	1687
5A	Granite tailings	60	25	1581
6A	Granite tailings	60	30	1672
7A	Granite tailings	60	40	1615
1B	Fly ash	60	2	1768
2B	Fly ash	60	5	1872
3B	Fly ash	60	11	1991
4B	Fly ash	60	20	1890
5B	Fly ash	60	25	1725
6B	Fly ash	60	30	1639
7B	Fly ash	60	40	1789
1C	Granite tailings	72	2	1348
2C	Granite tailings	72	5	1623
3C	Granite tailings	72	11	1448
4C	Granite tailings	72	20	1415
5C	Granite tailings	72	25	1261
6C	Granite tailings	72	30	1305
7C	Granite tailings	72	40	1187

[1] Based on total weight of composite being 100 wt %

[2] Based on the total weight of the two polyols being 100 wt %

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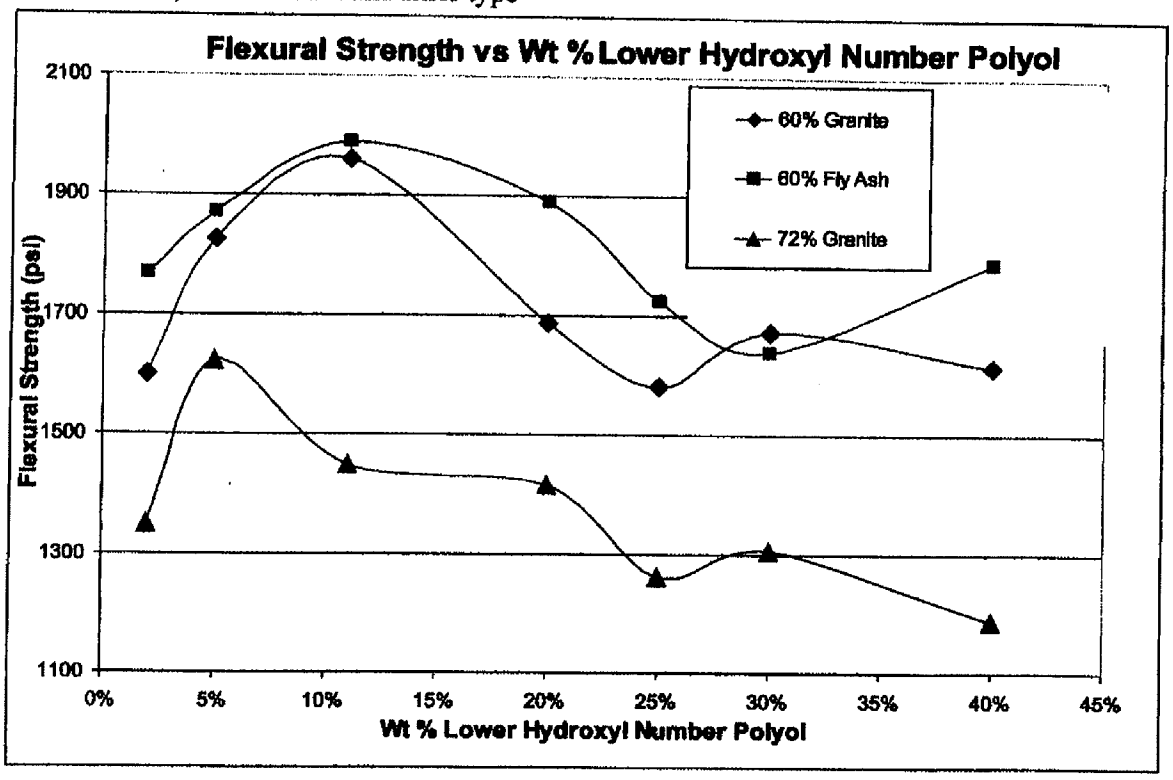
21. A summary of this data is presented in graphical form below.

Figure 1. Flexural strength of polyurethane composite samples with varying polyol concentration, filler amount and filler type



22. The data indicates improvement in flexural strength for samples comprising a lower hydroxyl number polyol between about 5 wt % and about 20 wt %, based on the total weight of the two polyols being 100 wt %, commensurate in scope with the claimed range in Independent Claims 1, 44 and 62. In my opinion, this range of improved flexural strength is unexpected. One would expect the flexural strength to steadily decrease as the percentage of lower hydroxyl number polyol increases. However, in contrast, this data shows a critical range in terms of flexural strength for samples comprising a lower hydroxyl number polyol between about 5 wt % and about 20 wt %. The data clearly shows that the samples comprising a lower hydroxyl number polyol between about 5 wt % and about 20 wt %, based on the total weight of the two polyols being 100 wt %, have unexpected improvements in flexural strength compared to

samples falling just outside that range. Therefore, in my opinion, the range included in Independent Claims 1, 44 and 62 is critical, and non-obvious over, the broad and general descriptions in Weisman.

23. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Wade H. Brown

7 July 2008
Date

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